PTO/SB/17 (07-06)
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FEE TRANSMITTAL for FY 2006

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 500

Complete if Known	
Application Number	10/650,208
Filing Date	August 28, 2003
First Named Inventor	Andrew W. Phillips
Examiner Name	Lan Nguyen
Art Unit	3683
Attorney Docket No.	GP-302782

METHOD OF PAYMENT (check all that apply)

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☒ Deposit Account Deposit Account Number: 07-0960 Deposit Account Name: General Motors Corporation

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee($)	Fee($)	Fee($)	Fee($)	Fee($)	Fees Paid ($)
Utility	300	150	500	250	200	100	____
Design	200	100	100	50	130	65	____
Plant	200	100	300	150	160	80	____
Reissue	300	150	500	250	600	300	____
Provisional	200	100	0	0	0	0	____

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims 29 -29 or HP= **Extra Claims** 0 x **Fee($)** ____ = **Fee Paid ($)** 0

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims 3 - 3 or HP= **Extra Claims** 0 x **Fee($)** ____ = **Fee Paid ($)** 0

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims
Fee ($) ____ **Fee Paid ($)** ____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof		Fee ($)		Fee Paid ($)
____	-	= 0	/ 50 =	0	(round up to a whole number) x		=	0

4. OTHER FEE(S)

Fees Paid ($)

Non-English Specification, $130 fee (no small entity discount) ____

Other (e.g., late filing surcharge) : Appeal Brief 500

SUBMITTED BY

Signature	Michael D. Wiggins	Registration No. (Attorney/Agent)	34,754	Telephone	248-641-1600
Name (Print/Type)	Michael D. Wiggins			Date	November 7, 2006

GP-302782 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appeal No. _______________

Application No.:	10/650,208
Filing Date:	August 28, 2003
Appellant:	Andrew W. Phillips
Group Art Unit:	3683
Examiner:	Lan Nguyen
Title:	THERMAL SIMULATION FRICTION DEVICE COOLING CONTROL

APPEAL BRIEF ON BEHALF OF APPELLANT UNDER 37 C.F.R. §41.37

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Due: November 13, 2006

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BRIEF ON APPEAL ON BEHALF OF APPELLANT

In support of the Notice of Appeal filed on September 8, 2006 appealing the Examiner's Final Rejection of each of claims 1, 3 – 10 and 12 – 26 mailed June 9, 2006, Appellant hereby provides the following remarks. Claims 1, 3 – 10 and 12 – 26 appear in the attached Appendix A, as amended in the After Final Amendment filed with the present Appeal Brief.

I. REAL PARTY IN INTEREST

The present application is assigned to the General Motors Corporation of Detroit, Michigan by an Assignment recorded on December 17, 2003 at reel/frame 014202/0670.

II. RELATED APPEALS AND INTERFERENCES

The undersigned, the Assignee and the Appellant do not know of any appeals or interferences which would directly affect or which would be directly affected by, or have a bearing on, the Board's decision in this Appeal.

III. STATUS OF THE CLAIMS

Claims 1, 3 – 10 and 12 – 26 are reproduced in the attached Appendix A and are the claims on Appeal. Each of these claims is currently pending in the application and reflects the amendments provided in the After Final Amendment filed with the present Appeal Brief.

IV. STATUS OF ANY AMENDMENTS FILED SUBSEQUENT TO THE FINAL REJECTION

An Amendment After Final has been concurrently filed with the present Appeal Brief in response to the Final Rejection dated June 9, 2006. The amendments correspond to those presented, though not entered for the purpose of appeal, in Applicant's response filed on August 1, 2006.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present application discloses an apparatus and method for controlling the **cooling** of a friction device (see paragraph [0001] of the original description). More specifically, the present application provides a model-based approach, which enables proactive cooling of a friction device to reduce peak temperatures and to prevent damage to friction device components, as discussed in further detail below.

Independent claim 1 provides a cooling system for cooling a friction device 16 including a flow control device 18 that controls a flow of cooling fluid through the friction device 16 (see Figure 1). Claim 1 further provides a controller 24 that estimates a temperature state of the friction device 16 based on an estimated heat rate (H_R) of the friction device 16, calculates a cooling flow command (F_K) based on the temperature state and operates the flow control device based on the flow command (F_K) (see paragraph [0026], Lines 4 – 9 of the original description).

Independent claim 10 provides a method of controlling cooling of a friction device 16 including estimating a temperature state of the friction device 16 based on an estimated heat rate (H_R) of the friction device 16 and calculating a cooling flow command (F_K) based on the temperature state. A cooling fluid flow through the friction device based on the cooling flow command (see paragraph [0026], Lines 4 – 9 of the original description).

Similarly, independent claim 20 provides a method of controlling cooling of a friction device 16 including calculating a heat rate (H_R) of the friction device, estimating a temperature state of the friction device 16 based on the heat rate (H_R). A cooling flow command (F_K) is determined based on the temperature state and a flow control device 18 is operated based on the cooling flow command (F_K) to control a cooling fluid flow into the friction device 16 (see paragraph [0026], Lines 4 – 9 of the original description).

In summary, each of the independent claims provides that a temperature state is estimated based on an estimated heat rate (H_R) of the friction device 16 and a fluid flow command (F_K) is calculated based on the temperature state (see paragraph [0026], Lines 4 – 7 of the original description and Figure 1). As explicitly provided for in the original specification, the friction device cooling control increases fluid flow (i.e., via the fluid flow command (F_K)) to stabilize and/or limit peak values of the temperature (see

paragraph [0026], Lines 7 – 9 of the original description). Accordingly, the fluid flow command (F_K) corresponds to a flow of cooling fluid, and therefore is implicitly or inherently considered a **cooling** flow command.

In accordance with the claims, the present application provides a model-based friction device **cooling** control without using a temperature sensor specifically associated with a friction device. More specifically, there is a critical interface temperature, at which damage to the fluid and/or the friction device occurs. By estimating the heat generation rate, as opposed to physically measuring a temperature, a temperature state is concurrently estimated. The estimated temperature state is the leading indicator of the required **coolant** flow to ensure that sufficient **coolant** flow is always present in time to remove friction heat, regardless of how fast the friction heat builds. Further, the model-based approach, as provided in claims 1, 10 and 20, can comprehend the critical interface temperature limit directly, thereby eliminating guesswork and destructive trials-and-errors of a sensor-based system.

It is further noted that the model-based approach of claims 1, 10 and 20, accounts for the delay between heat generation and temperature measurement, which is present in a sensor-based approach. Such a delay can result in clutch and/or fluid damage before adequate fluid flow is provided (see paragraph [0005] of the original specification). More specifically, within the time between the fluid leaving the clutch and physically measuring the fluid temperature using a sensor-based approach, the clutch temperature can significantly increase and clutch damage can occur.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant seeks the Board's review of the rejection of claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. § 102(b) as being anticipated by Lentz (U.S. Pat. No. 5,216,606).

Appellant also seeks the Board's review of the rejection of claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. § 102(e) as being anticipated by Buchanan (U.S. Pat. No. 6,715,597).

Appellant further seeks the Board's review of the apparent disapproval of claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. § 112 for lack of support in the original disclosure for the term "a cooling flow command".

VII. ARGUMENTS

A. Claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. §102(b)

1. Distinctions regarding independent Claims 1, 10 and 20

As discussed above, and in detail in the previously filed responses, claims 1, 10 and 20 include an apparatus and method for controlling **cooling** of a friction device. A temperature state is estimated based on an estimated heat rate of the friction device and a cooling flow command is calculated based on the temperature state. Lentz fails to teach or suggest regulating **cooling** of a friction device based on an estimate temperature state, which is based on an estimated heat rate of the friction device.

A proper reading of Lentz reveals a compensated control method for **engaging** an on-coming clutch in an automatic transmission. Lentz determines a clutch fill or **engagement** time (T_{FILL}) (see Col. 4, Lines 44 – 45) and a pump efficiency based on the **measured** temperature of the hydraulic fluid, which fills the clutch to induce **engagement** (see Col. 3, Lines 32 – 41). The pump speed, and thus the **engagement** of the clutch, is adjusted based on the pump efficiency (see Col. 6, Lines 1 – 18), which is affected by the fluid temperature. Accordingly, Lentz accounts for temperature changes in the hydraulic fluid used to **engage** the friction device, thereby enabling accurate regulation of the torque transfer through the friction device.

It is well established that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). As discussed above, Lentz does not disclose improved heat protection for the friction device and is limited to actually measuring a fluid temperature to adjust a pump, failing to teach or suggest estimating a friction device temperature or estimating a heat rate of the friction device. Accordingly, Lentz fails to disclose each and every element as set forth in the claim.

In addition to the above, the Examiner has implicitly admitted that Lentz fails to disclose each and every element of the claim, as required. In an attempt to cure the deficient disclosure of Lentz, the Examiner argues that "[i]t is well known that hydraulic [fluid] is used as an actuating/cooling fluid". This statement implies that **cooling** of a

friction device is indeed not disclosed in Lentz. Accordingly, the Examiner has implicitly acknowledged that Lentz fails to teach each and every element of claims.

For at least these reasons, it is respectfully requested that the rejection of the independent claims be overturned.

2. Lentz does not disclose the identical invention

It is also well established that "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). It is respectfully noted that the identical invention is not disclosed in Lentz.

In an effort to apply the **engagement-related** disclosure of Lentz to the **cooling** of the present application, the Examiner has stated that "[i]t is **believed** that it is well known for hydraulic fluid to act as a cooling fluid while actuating the clutch". This belief, however, is inaccurate because it is **not well known** for hydraulic fluid to act as a cooling fluid **while** actuating the clutch, as explained in further detail below.

Initially, it is noted that hydraulically actuated friction systems include a hydraulic actuator that mechanically engages the friction device components. The hydraulic actuator is a separate structure than the friction device itself, and typically includes a hydraulic chamber and a piston that is axially movable based on a hydraulic pressure within the chamber. AS the hydraulic chamber is filled with fluid (i.e., corresponding to the "fill time" of Lentz), the piston is induced to move. The piston separates the friction device components from the hydraulic fluid within the chamber. Axial displacement of the piston induces engagement/disengagement of the friction device. Because the hydraulic fluid within the hydraulic actuator is physically separated from the friction device by at least the piston, **the hydraulic fluid** is only operable as an engagement medium and **performs no cooling function** with respect to the friction device. For at least this reason, it is respectfully asserted that it is **not well known** for hydraulic fluid to act as a cooling fluid **while** actuating the clutch.

It is furthermore noted that the engagement fluid flow required to engage the clutch is wholly independent of the coolant fluid flow required to cool the clutch. The engagement fluid flow is commanded to control the engagement of the clutch to a

specific degree, and is not regulated to concurrently cool the clutch components. For example, when the clutch is fully engaged, the engagement fluid flow command is at its **maximum** value. Because there is no relative slip between the clutch components, no heat is generated and the cooling flow command is at its **minimum**. When the clutch is partially engaged, the engagement fluid flow command is **less than its maximum**. Because there is slip across the clutch components, heat is generated and the **cooling** flow command is at its **maximum**. In both of these instances, the engagement flow and cooling flow are completely opposite. For this additional reason, it is **not well known** for hydraulic fluid to act as a cooling fluid **while** actuating the clutch.

In view of the foregoing, not only is the Examiner's belief inaccurate and misleading, it illustrates that Lentz indeed does not disclose the identical invention in as complete detail as is contained in the claim.

For at least these additional reasons, it is respectfully requested that the rejection of the independent claims be overturned.

3. Dependent Claims 3 – 9, 12 – 19 and 21 – 26

With regard to dependent claims 3 – 9, 12 – 19 and 21 – 26, these claims are allowable for at least the reasons previously presented with regard to their corresponding independent claims. In addition, to the extent that they mention further aspects of the cooling apparatus and method, they are also even additionally allowable over the prior art of record. Accordingly, it is respectfully requested that the rejection of the dependent claims be overturned.

B. Claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. §102(e)

1. Distinctions regarding independent Claims 1, 10 and 20

As discussed above, and in detail in the previously filed responses, claims 1, 10 and 20 include an apparatus and method of controlling cooling of a friction device. More specifically, a temperature state is estimated based on an estimated heat rate of the friction device and a cooling flow command is calculated based on the temperature state. Buchanan fails to teach or suggest regulating cooling of a friction device based

on an estimate temperature state, which is based on an estimated heat rate of the friction device.

Buchanan discloses a method of controlling clutches in a dual clutch transmission. The method of Buchanan is executed using a sensor-based, reactionary system that determines bulk clutch temperature change based on a **measured** fluid temperature. As a result, Buchanan does not account for the delay between heat generation and temperature measurement, which can result in clutch and/or fluid damage before adequate fluid flow is provided. More specifically, within the time between the fluid leaving the clutch and measuring the fluid temperature, the clutch temperature can significantly increase and clutch damage can occur.

Furthermore, the sensor-based approach of Buchanan requires two temperature sensors, one to monitor the sump temperature and another to monitor the temperature of the fluid exiting the friction device (i.e., a temperature sensor that is associated with the friction device) (see 242 of Figure 3A). Accordingly, Buchanan provides an excellent example of an overly complicated and more expensive system, which is directly opposite to that provided by the present invention.

Buchanan fails to teach or suggest estimating a clutch temperature based on an estimated heat rate and further fails to teach or suggest a cooling flow command that is calculated based on the temperature state and that is not based on a signal from a temperature sensor associated with the friction device. Therefore, Buchanan fails to disclose each and every element as set forth in the claim and fails to disclose the identical invention in as complete detail as is contained in the claim, as required when applying 35 U.S.C. §102.

For at least these reasons, it is respectfully requested that the rejection of the independent claims be overturned.

2. Dependent Claims 3 – 9, 12 – 19 and 21 – 26

With regard to dependent claims 3 – 9, 12 – 19 and 21 – 26, these claims are allowable for at least the reasons previously presented with regard to their corresponding independent claims. In addition, to the extent that they mention further aspects of the cooling apparatus and method, they are also even additionally allowable

over the prior art of record. Accordingly, it is respectfully requested that the rejection of the dependent claims be overturned.

C. Amendments to the Claims

1. Original Support for the Amended Claim Language

In the Advisory Action of August 14, 2006, the Examiner has asserted that the feature of "a cooling flow command" lacks support in the original disclosure.

Initially, it is respectfully noted that **every section** of the application, as originally filed, references **cooling** of a friction device by controlling a fluid flow through the friction device (see, for example, the Title, Abstract and original claim 1, lines 1 – 2). In fact, the term "cooling" is recited no less than 40 times in the specification, as originally filed.

MPEP §2163 provides that "[w]hile there is no *in haec verba* requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure." (emphasis added) (see MPEP §2163(I)(B)). As noted above, **every section** of the application, as originally filed, references **cooling** of a friction device by controlling a fluid flow therethrough. As a specific example, the first sentence of paragraph [0020] of the original disclosure provides that "[f]luid flows through the friction device 16 to cool the friction device 16 and maintain the integrity of its components." For at least these reasons, the added claim limitations are at least implicitly or inherently, and arguably expressly, supported in the originally filed specification.

It is further noted that 37 CFR §1.75(d)(1) provides that "the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description." As noted above, **every section** of the original disclosure references **cooling** of a friction device by controlling a fluid flow therethrough. Accordingly, the description, as originally filed, provides clear support and antecedent basis so that the meaning of the term "a cooling flow command" is ascertainable by reference to the description in accordance with the requirements of 37 CFR §1.75(d)(1).

VIII. CONCLUSION

Appellant respectfully requests the Honorable Board of Patent Appeals and Interferences to reverse the Examiner's anticipation rejection of each of pending claims 1, 3 – 10 and 12 – 26 under 35 U.S.C. §102(b) and §102(e) in view of the Lentz and Buchanan patents, respectively.

Appellant respectfully submits that the prior art does not teach or suggest many of the friction device cooling control limitations present in the various claims and the Examiner has not provided proper evidence or support for anticipation by the references. Accordingly, for at least the aforementioned reasons, Appellant respectfully requests the Honorable members of the Board of Patent Appeals and Interferences to reverse the outstanding rejections in connection with the present application and permit each of claims 1, 3 – 10 and 12 – 26 to be passed to allowance in connection with the present application.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Michael D. Wiggins, Reg. No. 34,754 at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

Date: November 7, 2006

By: Michael D. Wiggins

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APPENDIX A

This is a complete and current listing of the claims, marked with status identifiers in parentheses, as amended in the After Final Amendment, which has been filed herewith.

1. (Previously Presented) A cooling system for cooling a friction device, comprising:

a flow control device that controls a flow of cooling fluid through said friction device; and

a controller that estimates a temperature state of said friction device based on an estimated heat rate of said friction device, calculates a cooling flow command based on said temperature state and operates said flow control device based on said flow command.

2. (Cancelled)

3. (Previously Presented) The cooling system of claim 1, wherein said controller determines a friction device torque and a friction device slip speed and calculates said heat rate of said friction device based on said friction device torque and said friction device slip speed signal.

4. (Previously Presented) The cooling system of claim 1, further comprising:

a sump for collecting said flow of fluid; and

a sump temperature sensor that generates a sump temperature signal, wherein said temperature state is further based on said sump temperature signal.

5. (Previously Presented) The cooling system of claim 1, wherein said temperature state is further based on a current cooling flow command.

6. (Previously Presented) The cooling system of claim 1, wherein said cooling flow command is further based on said heat rate of said friction device and a sump temperature of said flow of fluid.

7. (Previously Presented) The cooling system of claim 1, wherein said flow control device includes one of a fixed displacement pump, a variable displacement pump, an on/off valve and a variable opening valve.

8. (Previously Presented) The cooling system of claim 1, wherein said temperature state is a temperature of said friction device.

9. (Previously Presented) The cooling system of claim 1, wherein said temperature state is a thermal energy of said friction device.

10. (Previously Presented) A method of controlling cooling of a friction device, comprising:

estimating a temperature state of said friction device based on an estimated heat rate of said friction device;

calculating a cooling flow command based on said temperature state; and

controlling a cooling fluid flow through said friction device based on said cooling flow command.

11. (Cancelled)

12. (Previously Presented) The method of claim 10, wherein said heat rate is based on a friction device torque and a friction device slip speed.

13. (Previously Presented) The method of claim 10, further comprising measuring a temperature of said fluid flow, wherein said temperature state is further based on said temperature.

14. (Previously Presented) The method of claim 10, wherein said temperature state is further based on a current cooling flow command.

15. (Previously Presented) The method of claim 10, wherein said cooling flow command is further based on said heat rate of said friction device.

16. (Previously Presented) The method of claim 10, wherein said cooling flow command is further based on a temperature of said fluid flow.

17. (Previously Presented) The method of claim 10, wherein said step of controlling fluid flow comprises operating a flow control device based on said cooling

flow command.

18. (Previously Presented) The cooling system of claim 10, wherein said temperature state is a temperature of said friction device.

19. (Previously Presented) The cooling system of claim 10, wherein said temperature state is a thermal energy of said friction device.

20. (Previously Presented) A method of controlling cooling of a friction device, comprising:

calculating a heat rate of said friction device;

estimating a temperature state of said friction device based on said heat rate;

determining a cooling flow command based on said temperature state; and

operating a flow control device based on said cooling flow command to control a cooling fluid flow into said friction device.

21. (Previously Presented) The method of claim 20, further comprising:

determining a friction device torque; and

determining a friction device slip speed, wherein said heat rate is based on said friction device torque and said friction device slip speed.

22. (Previously Presented) The method of claim 20, further comprising measuring a temperature of said fluid flow, wherein said temperature state is further based on said

temperature.

23. (Previously Presented) The method of claim 20, wherein said temperature state is further based on a current cooling flow command.

24. (Previously Presented) The method of claim 20, wherein said cooling flow command is further based on said heat rate and a temperature of said fluid flow.

25. (Previously Presented) The method of claim 20, wherein said temperature state is a temperature of said friction device.

26. (Previously Presented) The method of claim 20, wherein said temperature state is a thermal energy of said friction device.

27. (Cancelled)

28. (Cancelled)

29. (Cancelled)

APPENDIX B

There is no evidence being submitted with this appeal.

APPENDIX C

There are no related proceedings.